

Institute of Actuaries of India

Subject CT7 – Business Economics

November 2013 Examinations

INDICATIVE SOLUTIONS

Introduction

The indicative solution has been written by the Examiners with the aim of helping candidates. The solutions given are only indicative. It is realized that there could be other points as valid answers and examiner have given credit for any alternative approach or interpretation which they consider to be reasonable.

Solution :

1. (C)
2. (A)
3. (A)
4. (D)
5. (D)
6. (C)
7. (A)
8. (B)
9. (B)
10. (D)
11. (C)
12. (A)
13. (C)
14. (B)
15. (D)
16. (B)
17. (D)
18. (D)
19. (A)
20. (C)
21. (B)
22. (A)
23. (D)
24. (B)
25. (D)
26. (B)
27. (C)
28. (A)
29. (D)
30. (A)

[Q.No. 1 to 30=45 Marks]

Solution 31 :

i) Assume Rohit has cash holdings equal to Rs Y. If he spends all his cash, Rohit's utility will be $\log(Y) = \log(10000) = 4$

(1 Mark)

ii) Rohit has a 0.25 probability of spending Y - 1000 cash and a 0.75 probability of spending Y cash. Thus, his expected utility is $0.75\log(Y) + 0.25\log(Y - 1000) = 0.75\log(10000) + 0.25\log(9000) = 3.988560627$

(2 Marks)

iii) If Rohit has a 0.25 probability of losing Rs1000, then Rohit's expected loss is

$$0.25 * 1000 + 0.75 * 0 = \text{Rs}250.$$

The actuarially fair premium should be equal to the expected loss, so the premium should be Rs250.

With this premium, he will have a guaranteed amount of cash to spend, equal to (Y-250), so his utility will be

$$\log(Y - 250) = \log(10000 - 250) = \log(9750) = 3.989004616.$$

Since $3.989004616 > 3.988560627$, Rohit's utility will be greater with insurance than without.

(3 Marks)

iv) The maximum Rohit would be willing to pay for this insurance will be the premium for which his expected utility will be 3.988560627 and his expected wealth will be

$$10^{3.988560627} = 9740.037464.$$

Thus, Rohit will be willing to pay at most $10000 - 9740.037464 = \text{Rs}259.9625357$

(1 Mark)

v) With insurance, Rohit's expected wealth becomes prior to the compensation becomes $0.7Y + 0.3(Y - 1000)$, and the expected loss is $0.3 * 1000 = \text{Rs}300$, so the actuarially fair premium is Rs300.

(3 Marks)

To see whether Rohit would buy such insurance, we compare the expected utility derived from the insurance: $\log(Y - 300) = \log(9700) = 3.986771734$ to the expected utility without insurance: 3.988560627

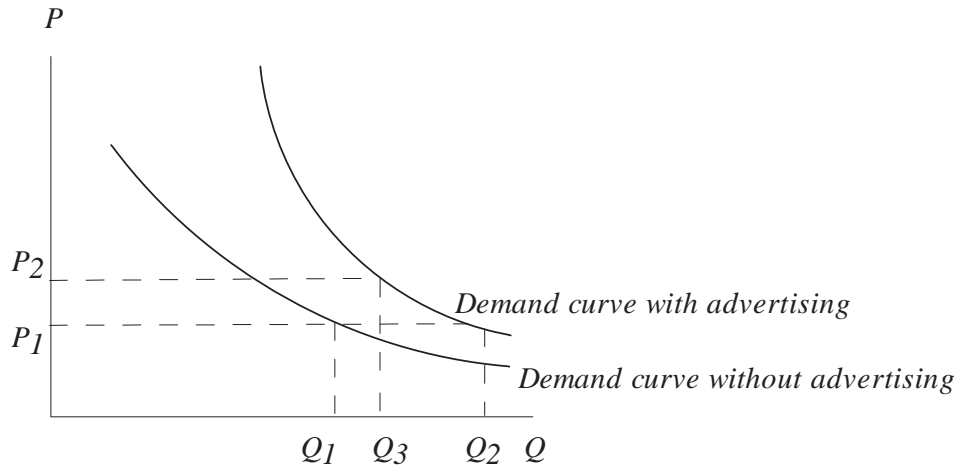
Since $3.986771734 < 3.988560627$, Rohit will not buy the insurance.

[Total 10]

Solution 32 :

Advertising a product is intended to shift the product's demand curve to the right

...and to make the product's demand less price elastic.



At price P_1 , the quantity demanded is Q_1 . After advertising, the demand curve shifts to the right enabling an increased quantity (Q_2) to be sold at the original price. However, as the advertising has also increased brand loyalty and so reduced the elasticity of demand, the firm can do better than this by increasing its price to P_2 and still increasing sales (to Q_3).

How advertising achieves these effects

Advertising can shift the demand curve to the right by bringing the product more to consumers' attention

... and informing consumers about the product's attractive features, especially relative to those of competitors' products.

Advertising can make the product's demand less price elastic by creating brand loyalty and so reducing the number of perceived substitute goods.

(4 Marks)

Solution 33 :**i) Assumption under Cournot model of duopoly**

Under the Cournot model of duopoly, each firm makes its price and output decisions on the assumption that its rival will produce a particular quantity. **(1 Mark)**

ii) Profit-maximising price and output for Firm B

If Firm B assumes that Firm A continues to produce an output of 40 units per year, then Firm B will face a demand curve with equation:

$$Q_B = 60 - 2P_B$$

$$\text{i.e. } P_B = 30 - .5Q_B$$

Its total revenue curve will be:

$$TR_B = P_B * Q_B$$

$$= 30Q_B - .5Q_B^2$$

Its marginal revenue curve will be:

$$MR_B = \frac{dTR_B}{dQ_B}$$

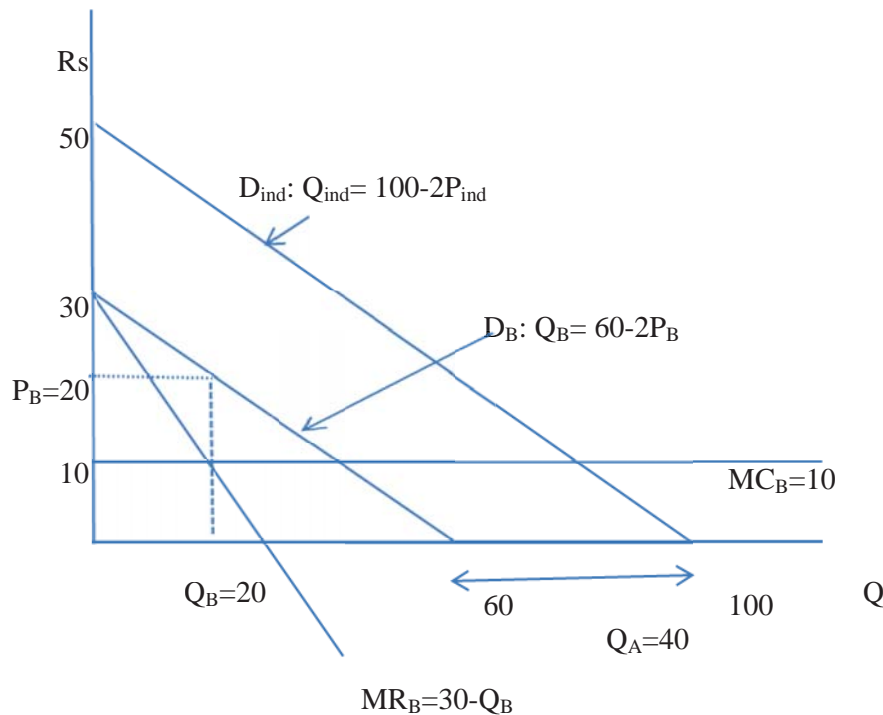
$$= 30 - Q_B$$

Firm B will maximise its profits where $MR = MC$. Since its marginal costs are 10 at all output levels, this will be where $MR_B = 10$

Hence, $Q_B = 20$

At this output level, $P_B = 20$

Firm B's profit maximising price and output is illustrated in the following diagram



(5 Marks)
[Total Marks-6]

Solution 34 :

Growth typically needs to be financed either from

- Internal funds (retained profits)
- New share issues
- Borrowing (from banks or by issuing corporate bonds)

Whichever way the growth is financed, the likely outcome in the short run is a reduction in the firm's share dividends.

... if the firm retains too much profit, there will be less to pay out in dividends

... Similarly if the firm borrows too much, the interest payments that it incurs are likely to make it difficult to maintain the level of dividends to shareholders.

... Finally, if it attempts to raise capital through issue of shares, the distributed profit will have to be divided between a large no of shares.

Therefore the more it invests, the more the dividends on shares in the short run will probably fall. Unless shareholders are confident that long-run profits and hence dividends will rise again, thus causing the share price to remain high in the long run, they may sell their shares.

This will cause share prices to fall. If they fall too far, the firm runs the risk of being taken over and certain managers risk losing their job.

This takeover constraint, therefore requires that managers of the growth maximising firm distribute sufficient profits to avoid being taken over.

Conversely, a lack of new investment & growth (perhaps coupled with high dividend payouts) may also render a firm susceptible to takeover by a competitor which thinks the firm could be run more efficiently and profitably.

The likelihood of takeover depends on the stock market's assessment of the firm's potential. The views of the stock market are reflected in the valuation ratio of the firm.

$$\begin{aligned}\text{Valuation ratio} &= \frac{\text{Stock market value of the firm's shares}}{\text{Book value of firm's assets}} \\ &= \frac{(\text{No of shares issued} \times \text{current share price})}{\text{Book value of firm's assets}}\end{aligned}$$

A low ratio means that the real assets of the business are effectively undervalued. The business is thus more attractive to potential bidders. Conversely firms with high valuation ratio are seen as overvalued and are unlikely to be the target of takeover bids.

In the long run, a rapidly growing firm may find its profits increasing, especially if it can achieve economies of scale and a bigger share of market. These profits can then be used to finance further growth. The firm will still not have unlimited finance, however, and will therefore still be faced by the takeover constraint if it attempts to grow too rapidly.

Hence Business managers must constantly tread a fine line between investing in business growth and paying shareholders an "adequate" dividend on their holdings.

(6 Marks)

Solution 35 :

i)

The pay-off for firm $i = \alpha; \beta$ is total profits, Π_i , which equals total revenue (TR_i) minus total cost (TC_i). Therefore, for the following sets of strategies:

(i) {High price, High price}

Total demand is equal to 10,000 and so each firm sells 5,000 units.

$$TR_i = 5,000 \times 10 = 50,000$$

$$TC_i = 5,000 \times 2 = 10,000$$

$$\Pi_i = 50,000 - 10,000 = 40,000 \quad (\text{for both } i = \alpha; \beta)$$

(ii) {Low price, Low price}

Total demand is equal to 18,000 and so each firm sells 9,000 units.

$$TR_i = 9,000 \times 5 = 45,000$$

$$TC_i = 9,000 \times 2 = 18,000$$

$$\Pi_i = 45,000 - 18,000 = 27,000 \quad (\text{for both } i = \alpha; \beta)$$

(iii) {High price, Low price}

Firm α sells 2,000 and while firm β sells 15,000 units.

$$TR_\alpha = 2,000 \times 10 = 20,000$$

$$TC_\alpha = 2,000 \times 2 = 4,000$$

$$\Pi_\alpha = 20,000 - 4,000 = 16,000$$

$$TR_\beta = 15,000 \times 5 = 75,000$$

$$TC_\beta = 15,000 \times 2 = 30,000$$

$$\Pi_\beta = 75,000 - 30,000 = 45,000$$

(iv) {Low price, High price}

Firm α sells 15,000 and while firm β sells 2,000 units.

$$TR_\alpha = 15,000 \times 5 = 75,000$$

$$TC_\alpha = 15,000 \times 2 = 30,000$$

$$\Pi_\alpha = 75,000 - 30,000 = 45,000$$

$$TR_\beta = 2,000 \times 10 = 20,000$$

$$TC_\beta = 2,000 \times 2 = 4,000$$

$$\Pi_\beta = 20,000 - 4,000 = 16,000$$

The pay-off matrix therefore is:

		Beta	
		High Price	Low Price
Alpha	High Price	(40, 40)	(16,45)
	Low Price	(45,16)	(27, 27)

Where Alpha's pay-off is first, and Beta's pay-off is second and both are given in \square thousands.

(5 Marks)

ii) Each player has a dominant strategy, low price. The equilibrium is therefore (low price, low price) with pay-off {27, 27}. Yes, one Nash equilibrium exists. Low,Low. Since no player has the incentive to move from this position.

(3 Marks)

iii) It has the two crucial characteristics of the Prisoner's Dilemma game: each player has a dominant strategy, low price. It also has the characteristic often found in Prisoners' Dilemma games that the equilibrium outcome is the one that gives the lowest joint pay-off. The two firms Alpha & Beta, by attempting independently to choose the best strategy based on what the other is likely to do, end up in a worse position than if they had co-operated in the first place (by colluding to charge high price strategy {40, 40}).

(2 Marks)**[Total Marks-10]****Solution 36 :**

i) Required reserves = 50 billion (= 25% of 200 billion); so excess reserves = 2 billion (=52 billion - 50 billion). **(0.5 Mark)**

ii) Maximum amount banking system can lend = 8 billion (= $1/.25 * 2$ billion). **(0.5 Mark)**

iii) Assets data

Reserves: 52 billion;

Securities 48 billion;

Loans: 108 billion.

Liabilities data: 208 billion.

(2.5 Marks)

iv) Monetary multiplier = 4 (= $1/.25$).

(0.5 Mark)**[Total Marks-4]****Solution 37 :**

i) (Supply Created), as Euros will be sold to buy Rupees to build the plant. **(1 Mark)**

ii) (Demand Created), as Imports by India will lead to selling of Rupees to buy Euros. **(1 Mark)**

iii) (Demand Created), maturity amount in Rupees needs to be converted into Euros. **(1 Mark)**

iv) (Supply Created), on fears of future depreciation Euros will be sold now.

(1 Marks)**[Total Marks]**

Solution 38 :

- i) In the short-run there is probably a tradeoff between unemployment and inflation. The government's expansionary policy should reduce unemployment as aggregate demand increases. However, the government has misjudged the natural rate and will continue its expansionary policy beyond the point of the natural level of unemployment. As aggregate demand continues to rise, prices begin to rise. **(2 Marks)**
- ii) In the long-run, workers demand higher wages to compensate for these higher prices. Aggregate supply will decrease (shift leftward) toward the natural rate of unemployment. In other words, any reduction of unemployment below the natural rate is only temporary and involves a short-run rise in inflation.

This, in turn, causes long-run costs to rise and a decrease in aggregate supply. The end result should be an equilibrium at the natural rate of unemployment and a higher price level than the beginning level. The long-run Phillips curve is thus a vertical line connecting the price levels possible at the natural rate of unemployment found on the horizontal axis.

(3 Marks)**[Total Marks-5]****Solution 39 :**

i)

Possible causes of depreciation include:

- a fall in domestic interest rates – so “hot money” would go abroad
- higher inflation in the domestic economy than abroad – so Indian goods are less competitive
- a rise in domestic incomes relative to income abroad – so the demand for imports increases
- relative investment prospects improving abroad – so investment moves abroad
- speculation that the exchange rate will fall – so dealers sell the currency.

(2 Marks)

ii)

Under a *fixed exchange rate* system, the rate of the currency is fixed against another currency or against an external standard of value such as gold. The government, through its central bank, intervenes in the currency markets to maintain the value of the currency.

The advantages of governments acting to fix exchange rates are:

- International trade and investment are less risky as profits are not affected by the exchange rate
- A reduction in speculation on exchange rate movements if everyone believes that exchange rates will not change
- More stable economic conditions, as the government is unable to pursue "irresponsible" macroeconomic policies (eg any attempt by the government to expand demand excessively in

the short term would cause inflation and a balance of payments deficit, which would place downward pressure on the exchange rate).

The following are disadvantages of fixed exchange rates.

Exchange rate policy may conflict with the interests of domestic business and the economy as a whole For example, an economy in recession may require interest rate cuts to stimulate consumer spending and investment, but increases in interest rates may be required to maintain the exchange rate.

Competitive contractionary policies leading to world depression

Countries may aim to achieve a balance of payments surplus in order to build up their reserves. One way to do this is to decrease the demand in the domestic economy.

However, countries in surplus must be balanced by countries in deficit. If each country attempts to have lower demand than the next, a world depression may result.

(4 Marks)

[Total Marks-6]
